

### Claims

#### We Claim:

1. A method for producing a polymerized product comprising:  
polymerizing at least one vinylaromatic monomer in the presence of a  
peroxide initiator and at least one diene polymer;  
adding at least one metal carboxylate to the vinylaromatic monomer,  
where the metal in the metal carboxylate is selected from the group  
consisting of Groups IA, IIA, VIII, IB and IIB of the Periodic Table  
(CAS notation); and  
recovering a polymerized product.
2. The method of claim 1 where the metal carboxylate is added in an amount  
effective to change the size of diene polymer particles in the resultant co-polymer  
as compared with an otherwise identical method absent the metal carboxylate.
3. The method of claim 1 where the amount of metal carboxylate added is  
effective to reduce the size of diene polymer particles in the resultant co-polymer  
as compared with an otherwise identical method absent the metal carboxylate.
4. The method of claim 1 where the metal in the metal carboxylate is selected  
from the group consisting of calcium, iron, cobalt, zinc, copper, potassium, and  
combinations thereof.
5. The method of claim 1 where the ligand of the metal carboxylate is  
selected from the group consisting of naphthenates, neodecanoates, versalates,  
and octoates of calcium, iron, cobalt and zinc, potassium, copper, and  
combinations thereof.

6. The method of claim 1 where the carboxylate moiety of the metal carboxylate is derived from a carboxylic acid selected from the group consisting of straight, branched, cyclic and aromatic carboxylic acids having from 2 to 15 carbon atoms.
7. The method of claim 1 where the metal carboxylate is added in an amount ranging from about 10 to about 900 ppm, based on the vinylaromatic monomer.
8. The method of claim 1 where the peroxide initiator is selected from the group consisting of 1,1-di-(t-butylperoxy)cyclohexane; 1,1-di-(t-amylperoxy)cyclohexane; t-amyl peroxy-2-ethylhexyl carbonate (TAEC), t-butylperoxy isopropyl carbonate (TBIC), ethyl-3,3-di(t-butylperoxy)butyrate; t-butyl perbenzoate; 1,1-di-(t-butylperoxy)-3,3,5-trimethyl-cyclohexane; ethyl-3,3-di(t-amylperoxy)butyrate; and di-isopropyl benzene monohydroperoxide (DIBMH).and mixtures thereof.
9. The method of claim 1 where polymerizing the monomer is conducted at a temperature between about 110°C and about 170°C.
10. The method of claim 1 where the weight ratio of vinylaromatic monomer to diene polymer is from about 97:3 to about 85:15.
11. The method of claim 1 where in the polymerized product recovered is high impact polystyrene (HIPS).
12. A method for producing a polymerized product comprising:  
polymerizing at least one vinylaromatic monomer in the presence of a  
peroxide initiator and at least one diene polymer;  
adding at least one metal carboxylate to the vinylaromatic monomer,  
where the metal in the metal carboxylate is selected from the group  
consisting of calcium, iron, cobalt, zinc, copper, potassium and

combinations thereof where the amount of metal carboxylate is effective to change the size of diene polymer particles in the resultant co-polymer as compared with an otherwise identical method absent the metal carboxylate); and recovering a polymerized product.

13. The method of claim 12 where the amount of metal carboxylate added is effective to reduce the size of diene polymer particles in the resultant co-polymer as compared with an otherwise identical method absent the metal carboxylate.

14. The method of claim 12 where ligand of the metal carboxylate is selected from the group consisting of naphthenates, neodecanoates, versalates, and octoates of calcium, iron, cobalt and zinc, potassium, copper, and combinations thereof.

15. The method of claim 12 where the metal carboxylate is added in an amount ranging from about 10 to about 900 ppm, based on the vinylaromatic monomer.

16. The method of claim 12 where in polymerizing the monomer, the peroxide initiator is selected from the group consisting of 1,1-di-(t-butylperoxy)cyclohexane; 1,1-di-(t-amylperoxy)cyclohexane; t-amyl peroxy-2-ethylhexyl carbonate (TAEC), t-butylperoxy isopropyl carbonate (TBIC), ethyl-3,3-di(t-butylperoxy)butyrate; t-butyl perbenzoate; 1,1-di-(t-butylperoxy)-3,3,5-trimethyl-cyclohexane; ethyl-3,3-di(t-amylperoxy)butyrate; di-isopropyl benzene monohydroperoxide (DIBMH).and mixtures thereof.

17. The method of claim 12 where in polymerizing the monomer is conducted at a temperature between about 110°C and about 170°C.

18. The method of claim 12 where the weight ratio of vinylaromatic monomer to diene polymer is from about 97:3 to about 85:15.

19. A vinylaromatic/diene copolymer resin formulation comprising at least one vinylaromatic monomer, at least one diene polymer, at least one peroxide initiator, and at least one metal carboxylate, where the metal in the metal carboxylate is selected from the group consisting of Groups IA, IIA, VIII, IB and IIB of the Periodic Table (CAS notation), and where the amount of metal carboxylate is effective to change the size of diene polymer particles in the resultant co-polymer as compared with an otherwise identical copolymer resin absent the metal carboxylate.

20. The vinylaromatic/diene copolymer resin formulation of claim 19 where the metal in the metal carboxylate is selected from the group consisting of calcium, iron, cobalt, zinc, potassium, copper, and combinations thereof.

21. The vinylaromatic/diene copolymer resin formulation of claim 19 where the ligand of the metal carboxylate is selected from the group consisting of naphthenates, neodecanoates, versalates, and octoates of calcium, iron, cobalt, zinc, copper, potassium, and combinations thereof.

22. The vinylaromatic/diene copolymer resin formulation of claim 19 where the carboxylate moiety of the metal carboxylate is derived from a carboxylic acid selected from the group consisting of straight, branched, cyclic and aromatic carboxylic acids having from 2 to 15 carbon atoms.

23. The vinylaromatic/diene copolymer resin formulation of claim 19 where the metal carboxylate is added in an amount ranging from about 10 to about 900 ppm, based on the vinylaromatic monomer.

24. The vinylaromatic/diene copolymer resin formulation of claim 19 where the peroxide initiator is selected from the group consisting of 1,1-di-(t-butylperoxy)-cyclohexane; 1,1-di-(t-amylperoxy)cyclohexane; t-amyl peroxy-2-ethylhexyl carbonate (TAEC), t-butylperoxy isopropyl carbonate (TBIC), ethyl-3,3-di(t-butylperoxy)butyrate; t-butyl perbenzoate; 1,1-di-(t-butylperoxy)-3,3,5-trimethyl-cyclohexane; ethyl-3,3-di(t-amylperoxy)butyrate; di-isopropyl benzene monohydroperoxide (DIBMH).and mixtures thereof.

25. The vinylaromatic/diene copolymer resin formulation of claim 19 where the weight ratio of vinylaromatic monomer to diene polymer is from about 97:3 to about 85:15.

26. The vinylaromatic/diene copolymer resin formulation of claim 19 where the vinylaromatic/diene copolymer is high impact polystyrene (HIPS).

27. An article made with the vinylaromatic/diene copolymer resin formulation of claim 19.

28. A vinylaromatic/diene copolymer resin formulation comprising at least one vinylaromatic monomer, at least one diene polymer, at least one peroxide initiator, and at least one metal carboxylate, where the metal in the metal carboxylate is selected from the group consisting of calcium, iron, cobalt, zinc, potassium and copper, and combinations thereof, and where the amount of metal carboxylate is effective to reduce the size of diene polymer particles in the resultant co-polymer as compared with an otherwise identical copolymer resin absent the metal carboxylate.

29. The vinylaromatic/diene copolymer resin formulation of claim 28 where the ligand of the metal carboxylate is selected from the group consisting of

naphthenates, neodecanoates, versalates, and octoates of calcium, iron, cobalt zinc, copper, potassium, and combinations thereof.

30. The vinylaromatic/diene copolymer resin formulation of claim 28 where the metal carboxylate is added in an amount ranging from about 10 to about 900 ppm, based on the vinylaromatic monomer.

31. The vinylaromatic/diene copolymer resin formulation of claim 28 where the peroxide initiator is selected from the group consisting of 1,1-di-(t-butylperoxy)-cyclohexane; 1,1-di-(t-amylperoxy)cyclohexane; t-amyl peroxy-2-ethylhexyl carbonate (TAEC), t-butylperoxy isopropyl carbonate (TBIC), ethyl-3,3-di(t-butylperoxy)butyrate; t-butyl perbenzoate; 1,1-di-(t-butylperoxy)-3,3,5-trimethyl-cyclohexane; ethyl-3,3-di(t-amylperoxy)butyrate; di-isopropyl benzene monohydroperoxide (DIBMH).and mixtures thereof.

32. The vinylaromatic/diene copolymer resin formulation of claim 28 where the weight ratio of vinylaromatic monomer to diene polymer is from about 97:3 to about 85:15.

33. The vinylaromatic/diene copolymer resin formulation of claim 28 where the vinylaromatic/diene copolymer is high impact polystyrene (HIPS).

34. An article made with the vinylaromatic/diene copolymer resin formulation of claim 28.